



NOAA's Climate Program Office

Modeling, Analysis, Predictions, and Projections Program

Aug 29 19:00

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Dan Barrie
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Modeling, Analysis, Predictions, and Projections Program

**Climate
Observations
and
Monitoring**

**Earth System
Science**

**Climate Program Office
Research Programs**

**Climate and
Societal
Interactions**

**Modeling Analysis,
Predictions, and
Projections**

MAPP's Major Objectives:

- Model Development
- Model Analyses
- Predictions/Projections
- Climate Applications



MAPP Program Activities – Snapshot

Evaluating CMIP5 predictions and projections for IPCC AR5

Climate Model evaluation and improvement

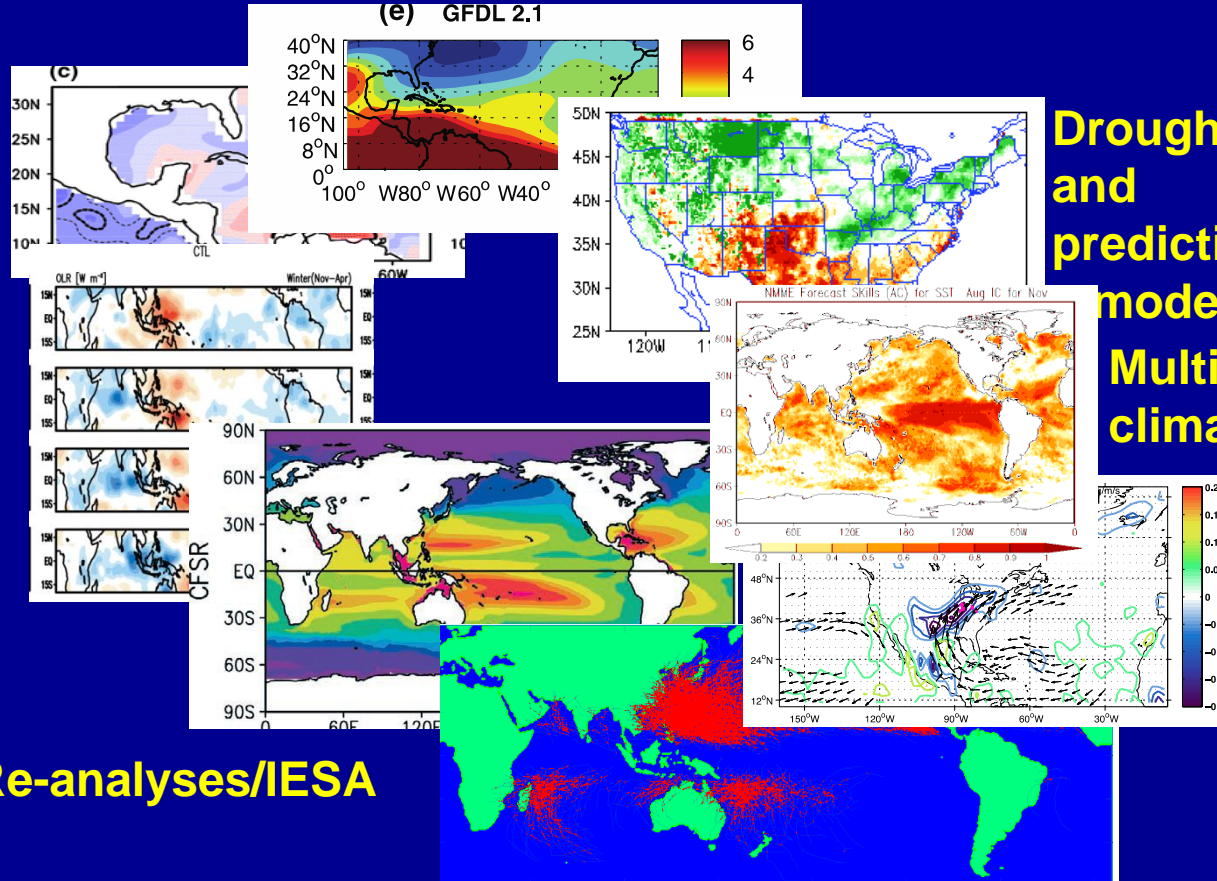
MJO understanding and modeling

Re-analyses/IESA

Regional-scale/high-resolution modeling

Drought monitoring and prediction/hydrologic modeling

Multi-model climate prediction



High-Resolution Climate Modeling

- Coordinated modeling experiment involving NCAR, GFDL, ESRL, and NASA to study the impact on MJO prediction of: i) increases in model resolution (going from 50- to 5-km horizontal grids), or ii) use of a “super-parameterization” of convection at 50-km horizontal grid spacing. Involves hindcasts with GEOS-5, CAM5, HiRAM, and WRF.

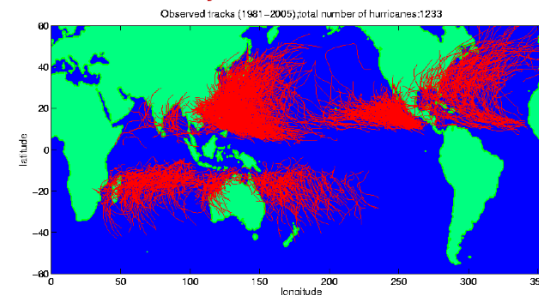
HiRAM at GFDL

Cubed Sphere 4x4x6

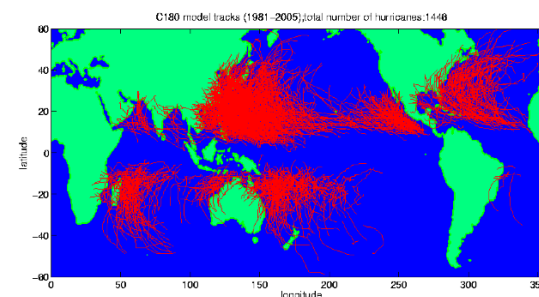


Courtesy of S Tulich, M Zhao

Observed cyclone tracks: 1981-2005



Simulated tracks: 1981-2005 (C180 model)

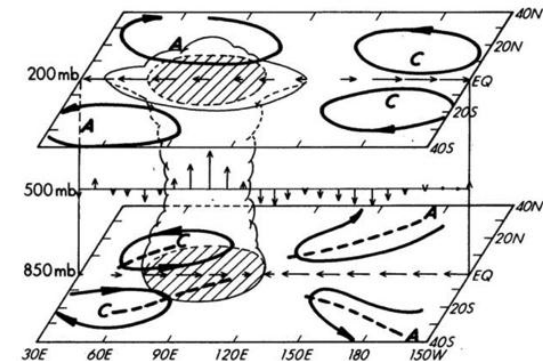
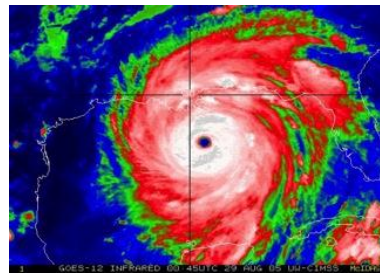


← One realization



High-Resolution Climate Modeling

- Several projects contributing to WCRP MJO Task Force, and U.S. CLIVAR Hurricane WG.

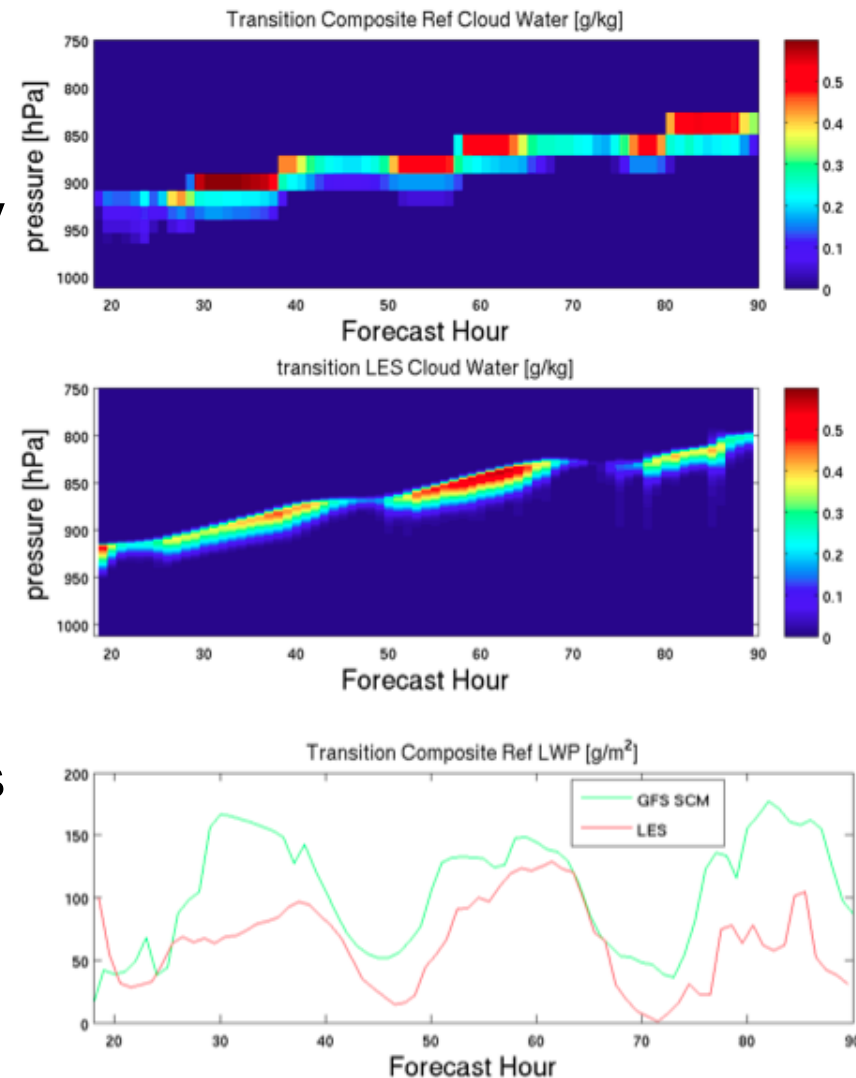


- COLA's high-resolution modeling experiments explore the hypothesis that high spatial resolution and process-resolving models can dramatically alter simulation of climate. Experiments with IFS including 13mo hindcasts down to 10km and simulations with NICAM down to 7km.
- Test adaptive vertical grid approach in the Multiscale Modeling Framework (MMF) climate model, which has been embedded in CAM.
- Experiments with two-way nesting with WRF-CCSM.



Model Development

- Climate Process Team in partnership with CTB to improve the representation of the cloudy boundary layer in NCEP GFS and CAM5 with a focus on the subtropical stratocumulus to cumulus (Sc-Cu) transition. Involving NCAR, NCEP, JPL, U of Washington, LLNL.
- Improving the representation of the stratosphere in CFS.
- Land modeling: NOAH LSM upgrades for groundwater, snow modeling, lake representation.
- NLDAS upgrades, with snow/soil moisture data assimilation.



Courtesy of C Bretherton



Climate Prediction

National Multi-Model Ensemble (NMME)

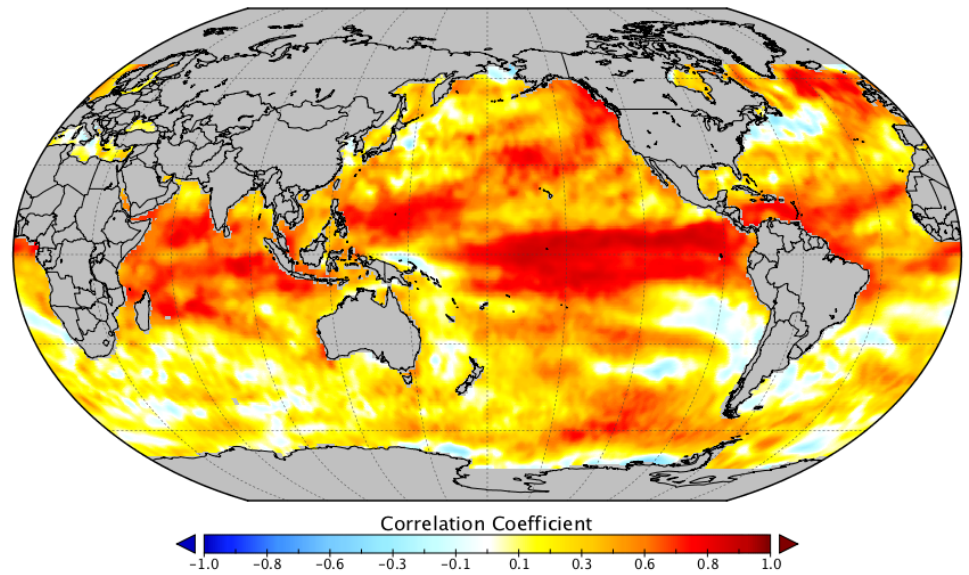
Led by NOAA, but an interagency/academic collaboration

Partners: U Miami, NCAR, COLA, IRI, U Colorado, NASA (GMAO), NOAA (EMC, CPC, GFDL), Princeton, CMC (prospective)

Phase 1: Utilize the available national models and a simple experimental design.

Phase 2: Purpose-driven experimental design; address specific research questions.

US NMME SSTA Correlation Coefficient
6 Month Lead August Initial Conditions (1982-2010)



Preliminary results. Each ensemble member from each model weighted equally – 83 ensemble members. Skill in SST prediction is high. Figure courtesy of Ben Kirtman.

Climate Prediction

National Multi-Model Ensemble
(NMME)

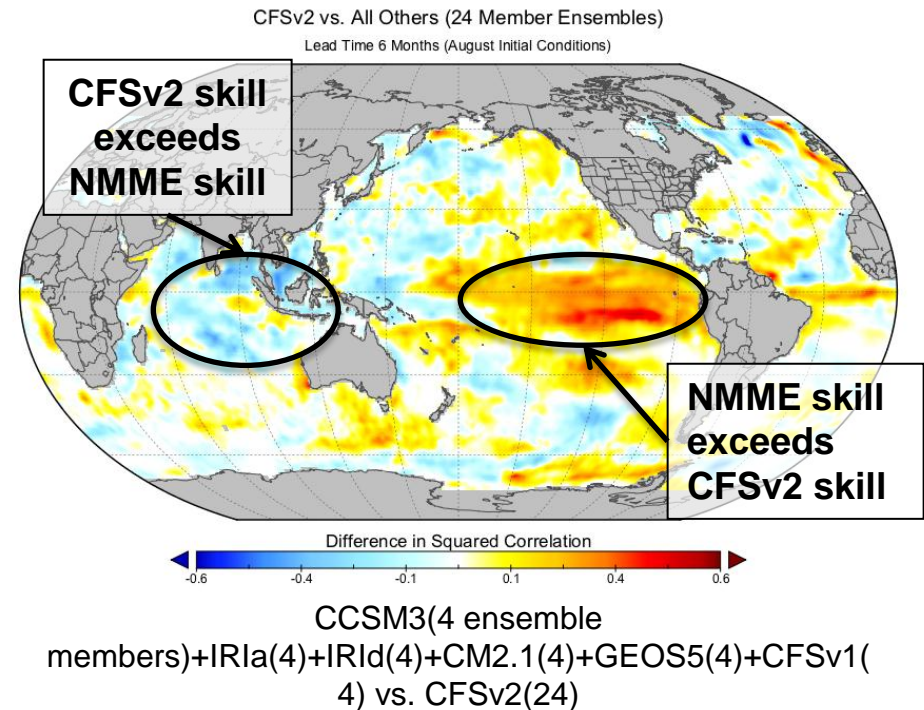
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All Others (24 Members) vs. CFSv2 (24 members)

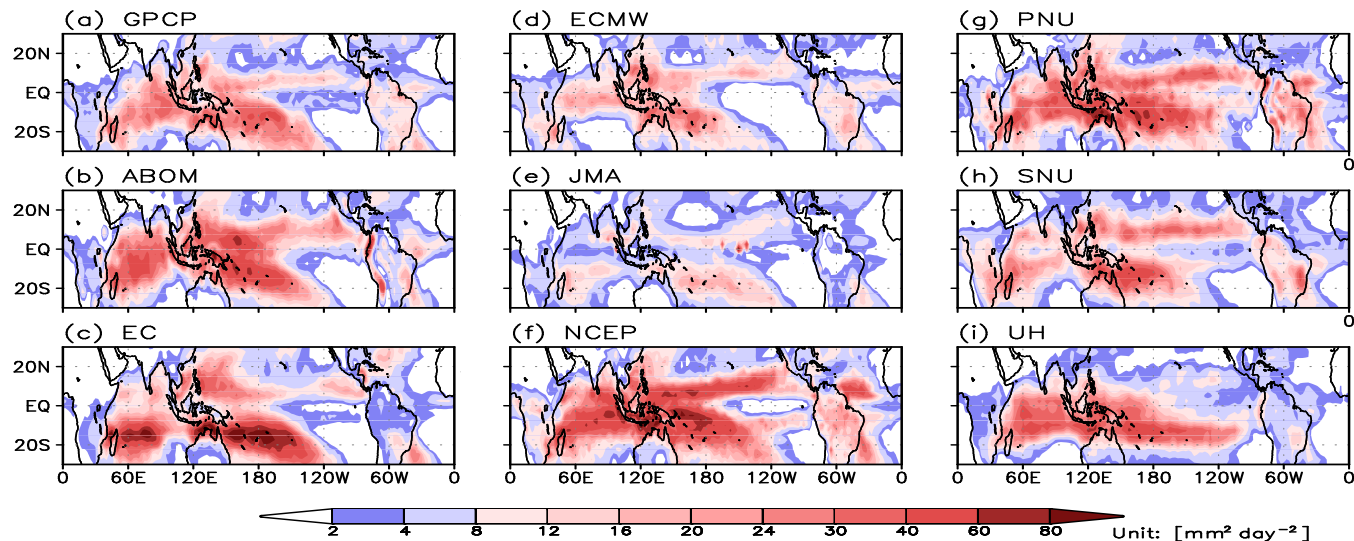


Temporal correlation based on 30 year hindcasts; mean squared differences.

Climate Prediction

- Intraseasonal Variability Hindcast Experiment (ISVHE): a coordinated multi-institutional ISV hindcast contributing to CLIVAR/AAMP, MJO WG.

Variance of 20-100-day Bandpass Filtered Precipitation in Observation and Control Simulations (NDJFMA)



Courtesy of Bin Wang

Climate Prediction

- FY12 research call: Advance intra-seasonal to decadal climate prediction.
 - Compare dynamical, statistical, and hybrid or consolidated systems
 - Impact of initializing select components of the Earth system (e.g., ocean, land, ice, etc.)
 - Optimal choice of ensemble members, forecast times, model diversity
 - Understand impact of climate model biases and their evolution in forecast time (e.g., “drift” in decadal predictions)
- Three-year research projects
- Received 38 proposals targeting a variety of timescales and topics
- Final funding decisions pending



Model Evaluation

- MAPP CMIP5 Task Force:
 - 30 PIs, mostly MAPP funded, initiated in Nov. 2011, lifespan of 3 years.
 - Aims at evaluating simulations of the 20th century climate and the uncertainties in long-term predictions and projections of 21st century climate over North America.
 - Initial task: contribute to IPCC AR5 with 3 group papers (in addition to individual papers) focusing on North America's climate evaluating: 1) 20th century model simulations, 2) 21st century projections and associated uncertainties, and 3) decadal hindcasts and 21st century predictions. A multi-model perspective.
- Upcoming CFSv2 model evaluation workshop in Spring 2012 to inform the development of CFSv3 organized by NCEP CTB in partnership with MAPP.

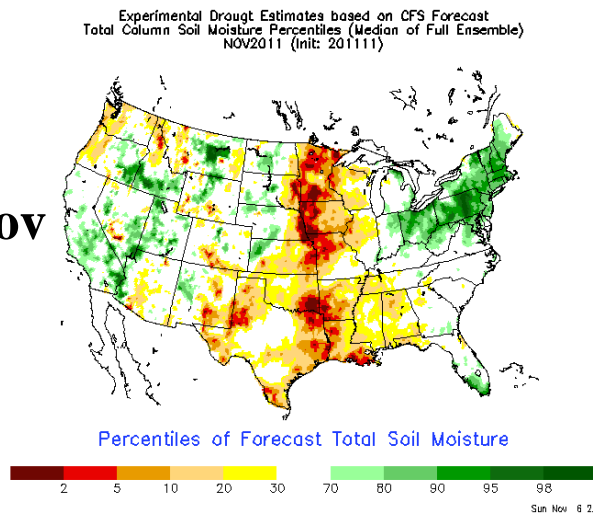


Drought Monitoring and Prediction

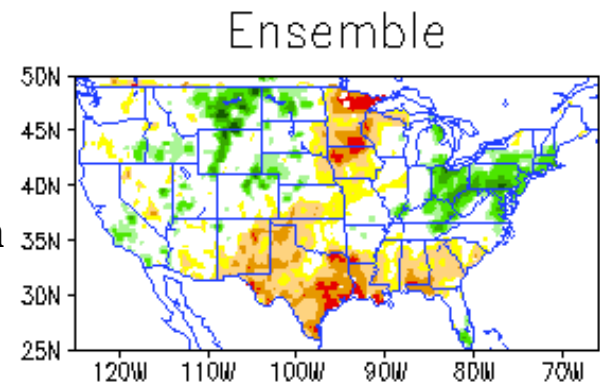
- MAPP Drought Task Force:

- 30 PIs, mostly MAPP funded, initiated in Oct. 2011, lifespan of 3 years.
- Aims at achieving significant new advances in current capabilities to monitor and predict drought over North America. Strong connection with NIDIS and the WCRP Drought activities.
- Initial task is to develop a Drought Testbed framework that research groups can use to test/evaluate methods and ideas.
- 3 WGs: 1) Metrics, 2) Test cases, and 3) Drought Early Warning System.

**Dec Fcst
initialized Nov
2011**



**Dec Fcst
Verification**



Courtesy of E Wood and K Mo

ESPC/MAPP-CPO Relationship

- MAPP, along with other CPO programs, funds research that lays the groundwork for ESPC
 - Seamless prediction problem
 - Initialization for prediction
 - Infrastructure (Global Interoperability Program – Don Anderson)
 - Seasonal to decadal prediction (FY12 MAPP research call; ongoing research projects; NMME)
- Ripe topic for discussion with USGCRP Interagency Group on Integrative Modeling



Further Program Information

Access MAPP Materials Through

<http://www.climate.noaa.gov/>

- Program information
- Funded projects
- Webinar recordings/schedule (next: Extremes, April 10)
- Drought and CMIP5 Task Force information

